light **88***a* onto a desired area of the subject retina **30**. It will be understood that under some test conditions, an applanation means such as a flat, optically clear lens or plane may be used to flatten or deform the cornea **20** to a desired shape to thereby allow better or more accurate imaging. Alternatively, an appropriate contact lens for fundus viewing may be employed.

The focused redirected light **88***c* illuminates the retina thereby causing auto-fluorescence of the associated flavoproteins (FPs). The generated FP auto-fluorescence **82***a* may be directed away from the subject retina **30** and through the components of the optics stage **92**, and the dichroic reflector **90** to an emission filter **98** such as, for example, an OMEGA OPTICAL® Model No. XF3003 (520DF40). The emission filter **98** may be selected to prevent wavelengths that do not correspond to FP auto-fluorescence wavelength, (e.g., wavelengths of or around 530 nm) from passing through its structure. The filtered FP auto-fluorescence **82***b* may then pass through a focusing lens **100** which focuses FP auto-fluorescence **82***c* on the still camera or CCD camera **82**. At this point the filtered FP auto-fluorescence **82***b* may be displayed on a video display unit **104** such as a LCD or cathode ray tube for visual evaluation, or may be communicated to a personal computer **106** for analysis, storage or other desired image processing.

The CCD camera **82** may further include and cooperate with an image intensifier **102** to magnify the brightness of the focused FP auto-fluorescence **82***c* to facilitate analysis of the captured image. The image intensifier **102** will likely be selected such that the gain, which is the ratio between the signal captured by the detector of the CCD camera **82** and the corresponding output signal, represents an increase of 100 to 1000 times the original image intensity. The image can be acquired, for example, by using a high-speed PRINCETON ST-133 interface and a STANFORD RESEARCH SYSTEMS® DG-535 delay gate generator with speeds ranging from 5 nsec to several minutes. The delay gate generator cooperates with the CCD camera **82** and the image intensifier **102** to synchronize and control the operation of these components. It will be understood that this captured image represents only the focused FP auto-fluorescence **82***c* in an intensified form, the unwanted auto-fluorescence information or noise having been minimized by the operation of the excitation filter **86** and the emission filter **98**. In this manner, the resulting single image captured by CCD camera **82** has a high S/N ratio and provides a clear and detailed image representing the FP auto-fluorescence **82***a*-**82***c*.

The components of the retinal evaluation apparatus **80** described herein may be used in a stand alone fashion, wherein alignment is accomplished via manual clamping and securing of the individual components. However, the imaging, excitation and optical components of the retinal evaluation apparatus **80** may be integrated into any known desktop or handheld ophthalmoscope, slit-lamp, or fundus camera, to allow easy upgrade to the testing equipment described herein. Specifically, the CCD camera **82**, the excitation light source **84**, the optics stage **92**, and the associated components may each be equipped with an adaptor (not shown) designed to allow each of the individual components of the retinal evaluation apparatus **80** to be mated with the ophthalmoscopes and other devices discussed above. In this case, the standard ophthalmoscope, fundus, or slit-lamp light may be replaced with the excitation means **84** affixed to the ophthalmoscope frame using a bracket or adaptor and the light output by the excitation means **84** maybe filtered to produce the desired excitation light **84***a*. An image detection device may be attached to the frames of the devices and aligned opposite the retina **30** to detect a single image representing the FP auto-fluorescence generated in response to the excitation light **84***a*. In this manner, existing devices can be retrofitted to allow known diagnostic equipment to be used to excite and evaluate retinal auto-fluorescence.

Although certain retinal evaluation systems and methods have been described herein in accordance with the teachings of the present disclosure, the scope and coverage of this patent is not limited thereto. On the contrary, this patent is intended to cover all embodiments of the teachings of the disclosure that fairly fall within the scope of the permissible equivalents.

What is claimed is:

1. A device for measuring apoptotic activity of an eye, said device comprising:

an excitation light source to provide an excitation light that maximizes the excitation of flavoprotein auto-fluorescence in a retina and minimizes the excitation of non-flavoprotein auto-fluorescence in the retina and

image capture means for recording a single image representative of a retinal fluorescence signal generated immediately in response to the excitation light to minimize inaccuracies introduced by eye movements and rapid physiological changes, said image capture means including

a filter to maximize the passage of flavoprotein auto-fluorescence in the retinal fluorescence signal and

image intensifier means for providing a focused amplified image showing evidence of apoptotic activity in the eye and increase the retinal fluorescence signal strength.

2. The device of claim **1**, wherein said excitation light source comprises a mercury lamp.

3. The device of claim **2**, wherein said excitation light source comprises an excitation filter having a filter range corresponding to excitation of flavoprotein auto-fluorescence.

4. The device of claim **1**, wherein said excitation light source comprises a laser.

5. The device of claim **1**, wherein said excitation light source is aligned with the retina using a dichroic reflector.

6. The device of claim **1**, wherein said excitation light source is aligned with the retina using a fiber optic system.

7. The device of claim **1**, wherein said image capture means comprises a charge coupled device.

8. The device of claim **1**, wherein said image capture means comprises a still camera.

9. The device of claim **1**, wherein said image capture means comprises a charge coupled device camera.

10. The device of claim **1**, wherein said image intensifier means includes a gain factor of at least 100.

11. The device of claim **1**, wherein said image capture means has a field of view sized to capture a single image of the retinal fluorescence signal generated by the retina.

12. The device of claim **1**, further comprising a processor programmed to analyze the retinal fluorescence signal with respect to a second stored retinal fluorescence signal.

13. The device of claim **1**, further comprising a processor programmed to analyze the retinal fluorescence signal to determine a contrast change.

14. The device of claim **13**, wherein said processor is programmed to analyze the retinal fluorescence signal to determine a local contrast change.

15. The device of claim **13**, wherein said processor is programmed to analyze the retinal fluorescence signal to determine a rate of contrast change.

16. A method of noninvasively measuring apoptotic activity, the method comprising: